4.4 COMMERCIAL AND SPORT FISHERIES

The area in the immediate vicinity of the proposed Shell Terminal supports American shad and shallow-water habitat for various species of fish. At the Martinez Marina, popular sport fisheries include angling for striped bass, flounder, and sturgeon. A small commercial fishery for shrimp exists in the Carquinez Strait. The Strait also serves as a migratory corridor for Chinook salmon, striped bass, Pacific herring, northern anchovy, white sturgeon, and longfin smelt. Further east in Suisun Bay and extending to the western edge of the legally defined Delta, white sturgeon habitat and fishery, Chinook salmon habitat and fishery, crayfish, longfin smelt, Pacific staghorn sculpin, northern anchovy, starry flounder, striped bass, perch, and yellowfin goby are of interest to anglers. About 15 marinas, piers, and public recreational areas provide access to the area near the Shell Terminal facility. In San Francisco Bay, the two main commercial fisheries are for herring and shrimp, with herring contributing to about 1 percent of total California landings in 2000. Sport fishing, from the average of 59 charter boats (1989-2003), private boats, shorelines, and piers in the bay, targets Chinook salmon, sturgeon, striped bass, smelt, surf perch, halibut, rockfish, and clams, among other species. All of these activities, in addition to the harvest along the coast, contribute to California's fishing industry and recreational economy.

Section 4.4.1, Environmental Setting, describes the environmental setting for commercial and sport fisheries. Section 4.4.2 describes the regulatory setting for commercial and sport fisheries. Section 4.4.3 presents the Impact Significance Criteria for commercial and sport fisheries. Section 4.4.4, Impact Analysis and Mitigation Measures, examines the potential for impacts to these resources from continued operation of the Shell Terminal. The major issues focus on: (1) the effects of continued Project operations, including the associated vessel traffic, on commercial, sport, and subsidence fishery resources and activities; (2) the effects of potential oil spills on fishery resources and activities; and (3) the effects of continued operations and potential oil spills on subsidence fisheries. Section 4.4.5, Impacts of Alternatives, presents the alternatives to the proposed Project, and Section 4.4.6, Cumulative Projects Impact Analysis, presents the cumulative analysis.

4.4.1 Environmental Setting

Methodology and Data Collection

The detailed geographic focus of this Draft EIR is from the Interstate 80 (I-80) bridge, encompassing Carquinez Strait and Suisun Bay, to the western edge of the legally defined Delta, just west of Pittsburg (about 64 square miles). This area encompasses the Shell Terminal and the areas east and west most susceptible to oil spills. Information for this area from existing information sources is updated, as needed. Vessels using the Shell Terminal transit through San Francisco Bay, so the area from the Golden Gate to the entrance of Carquinez Strait is the secondary area of study and will be generally described using existing data. Finally, potential for impacts from

vessels transiting the outer California coast will be briefly presented by incorporating information from other documents by reference. Several databases and maps describe the fisheries, aquaculture operations, and kelp harvesting activities in these areas.

To characterize the existing environment in the San Francisco Bay Estuary, which extends from the mouth of Coyote Creek near the city of San Jose in the south to Chipps Island at the eastern end of Suisun Bay, CDFG catch and landing statistics, anecdotal information from interviews with knowledgeable individuals, and written materials were used to describe commercial and recreational fisheries. A short description of the CDFG fisheries databases is provided to explain their uses and limitations.

To standardize fish landing reporting, CDFG divides coastal and Bay waters into reporting blocks. CDFG provides both commercial and charter boat fish landings by fishing area or block (where the fish are caught) and by port or region (where the fish are landed). Fish dealers, processors, or charter boat operators record landings data. For commercial fisheries, data concerning species, weight, catch block, mode (gear type), and price paid to fishing operators are provided to CDFG. Charter boat operators report to CDFG the number of fish caught on their boats.

The collected fish landings data have their limitations. For commercial fisheries, the data may not be entirely accurate or complete as fishing operators may report catches in blocks other than where the fish were actually caught. Catches often occur in more than one block, but may be reported for only one block. Because of these limitations, the CDFG data are supplemented by other information to better describe the fisheries.

For recreational data, the charter boat landings provide the only consistent database that records angler catches, despite the fact that catches from recreational private boats, shore/beaches, and piers make up about 86 percent of total recreational catches (U.S. Department of Commerce 1997). Information from seafood consumption studies is used to further describe the fisheries but these data are based on short-term sampling studies that describe a snapshot in time, rather than a long-term history of fishing activity. These databases were used despite these limitations; qualitative updates are provided from other sources, as needed.

Carquinez Strait and Suisun Bay Fisheries, West of the Legally Defined Delta

Historical Overview

San Francisco Bay is divided into three connecting bays: San Francisco Bay proper, San Pablo Bay, and Suisun Bay. The Carquinez Strait links the Sacramento/ San Joaquin Delta and Suisun Bay with San Pablo and San Francisco Bays. This system of bays is influenced by the ocean and its tides and by large volumes of freshwater runoff from the Sacramento and San Joaquin River watershed; the Strait is where the fresh water and salt water meet. The watersheds begin in the Sierra Nevada and drain California's Central Valley. In general, most of the San Francisco Bay is very shallow, with an average depth of about 20 feet (Squire and Smith 1977).

One of the environmental influences on the estuary and its fish is movement of the null zone, which marks the upstream edge of seawater influence. The location of this zone moves upstream and downstream several miles daily, depending on changes in freshwater flows from the rivers and streams. On the downstream side of the zone, saltwater fish predominate; freshwater fish are found on the upstream side. Therefore, fishing areas for some species generally cover broad areas of the Bay, but shift within the areas depending on the zone's location. Changes in tides, water conditions, seasons, and human activities also influence the estuary's fisheries.

Historical Summary

Historically, major native fisheries in the area included shrimp, sturgeon, and Chinook salmon, among others. Striped bass, an introduced species, is also very popular among anglers in the estuary.

The estuary's fisheries have always been important to humans as evidenced by the tens of thousands of people who lived along its shores before Europeans arrived. By the 1800s, fish were a major resource for settlers, with the primary species being Chinook salmon, sturgeon, striped bass, and Pacific herring. The Bay-Delta region was the largest fishing center on the west coast. However, human use of the Sacramento River system and the Bay took a heavy toll. Adverse impacts on the Bay and fisheries began with siltation caused by hydraulic mining in the mid-1800s. As California's population grew, extensive land reclamation, dredging and filling, urban development, water pollution, dams, upstream water diversions, and other water developments altered the estuary to such an extent that Bay fisheries declined significantly. Historically, over fishing also took a toll on fisheries. However, in recent years, other activities have caused major declines.

Another factor that drastically changed the Bay's food web was the introduction of non-native plant and animal species, beginning in the nineteenth century. American shad, striped bass, carp, and catfish were deliberately introduced. Introduction of non-native species accelerated in the twentieth century with the continued deliberate introduction of fish and the unintended introduction of harmful invertebrates and fish, mainly through ship ballast water (CALFED Bay-Delta Program 1999). The Asian clam was first detected in 1986 and within a few years was seen in concentrations of up to 1,500 per square meter in Suisun Bay. It is now the most abundant invertebrate species in Suisun and San Pablo Bays consuming food and dominating habitat that would otherwise serve native species (California State Coastal Conservancy 1995).

Shrimp

The shrimp fishery began in the early 1860s; by 1871 Chinese immigrants fished using stationary shrimp nets and were exporting large quantities of dried shrimp meal to China. Annual landings peaked in 1890 to over 5 million pounds. By 1915, shrimp were fished by beam trawl and in 1935 landings totaled 3.4 million pounds. Landings steadily declined due to reduced demand for fresh and dried shrimp for food. By the

early 1960s, average annual landings declined to 1,500 pounds. In 1965, this fishery bounced back to supply as live bait for sturgeon and striped bass sport fishing (CDFG 2001).

Sturgeon

Sturgeon have been very important to Californians; sturgeon remains have been found in Native American middens in the Bay/Delta region. White sturgeon has dominated the fishery; although there have been small catches of green sturgeon. The commercial fishery lasted from the early 1860s to 1901 and concentrated in the Bay and Delta. Fishing gear included gillnets, longlines and multiple unbaited hooks. Landings peaked at 1.65 million pounds in 1887, declined to 0.3 million pounds in 1895 and to 0.2 million pounds in 1901, when the fishery was closed. Sport fishing for sturgeon was later legalized in 1954. In 1964, the small catch increased significantly when the minimum size limit decreased from 50 inches to 40 inches and it was discovered Bay shrimp were effective bait. By the 1980s the harvest rate was 40 percent greater than the rate during the two earlier decades. In 1992 a minimum size limit of 46 inches and a maximum 72-inch size limit were established to protect the species from over harvest. (CDFG 2001). Permitted fishing gear is limited to hook and line.

Chinook salmon

The only major salmon species to enter the Golden Gate is Chinook salmon. As with sturgeon, salmon fisheries existed long before European settlers arrived in the 1700s. Harvests of Sacramento/San Joaquin watershed Chinook salmon by American Indians may have exceeded 8.5 million pounds annually. Traditional fishing methods included use of gill and dip nets, fishing spear and communal fish dams. The commercial fishery began with the advent of the gold rush. By 1860 the gillnet fishery was well established in Suisun Bay, San Pablo Bay and the lower reaches of the two rivers. The canning industry stimulated the growth of the fishery, with canneries operating throughout the river system. In 1882 the fishery reached its peak when 12 million pounds were landed. Shortly thereafter, the fishery collapsed due primarily to pollution and degradation of rivers by mining, agriculture, and timber operations, combined with increased landings. By 1919 the last cannery closed, and in 1957 the last inland commercial fishing area open to the general pubic was permanently closed (CDFG 2001).

The ocean troll fishery continued and today's trollers use fishing techniques developed during the 1940s. In addition, electronic equipment has significantly increased the efficiency of the modern troller. In the 1960s and 1970s the fishing industry enjoyed relatively high and consistent harvests, averaging about 7 million pounds annually of Chinook. Later commercial harvests have been much more erratic, with the largest catch being 14.4 million pounds in 1988 and the lowest harvest being 1.6 million pounds in 1992, an El Niño year (CDFG 2001).

The ocean sport fishery became popular with the development of the commercial passenger fishing vessel (CPFV) after World War II. The highest sport landings occurred in 1995 when anglers landed a record 397,200 Chinook. The lowest landings during the last 30 years were recorded in 1983 (CDFG 2001).

Oceanic and in-river conditions play major roles in salmon catches; however the variability can also be attributed to changes in fishery regulations. Since 1988, progressively more restrictive regulations have been imposed on the commercial fishery to protect stocks of special concern, including those that are Federal and State endangered or threatened species. As an example, the sport fishery is the only allowable salmon fishery in the estuary.

Striped bass

A major sport fishery has evolved around the striped bass. Striped bass were introduced in 1879 by railcar from the east coast; 132 were unloaded in Martinez and released in the Carquinez Strait. Three years later 300 more bass were shipped in and released; the entire west coast striped bass fishery evolved from these introductions. In the 1970s legal sized bass (over 18 inches) numbered around 2 million. By 1995, because of pollution and freshwater diversions, the population of legal bass hovers around 800,000 (California State Coastal Conservancy 1995).

Fisheries Near the Shell Terminal

The Shell Terminal is located in CDFG fish block 308. This block encompasses the Carquinez Strait and western extent of Suisun Bay; block 302 includes the remainder of Suisun Bay. Landings for block 308 are reported below and in Appendix C, Table C-1. For all CDFG blocks, catch block data appear to be sporadic from year to year due to inaccuracies in the reporting of landing locations. The data are supplemented by information from other sources.

Commercial Fisheries

The prominent commercial fishery in the vicinity of the Shell Terminal is the shrimp trawl fishery. The modern fishery, which began in 1965, has been harvested entirely by beam trawl. Most shrimp are harvested for bait; a small percentage of catch is still reserved for human consumption. Live tanks are used on all vessels and shrimp are transported to local bait shops by truck in either the tanks or iced-down wooden trays.

From 1991 to 2004, recorded landings in block 308 totaled over 21,000 pounds (65 percent of the total catch in the block). These landings compare with over 19.4 million pounds for the entire estuary; by far, most shrimp are caught in South

San Francisco Bay. Along with shrimp, trawlers also harvest staghorn sculpin, yellowfin goby and Chinook salmon, for example totaling 2,558, 2,269 and 3,399 pounds, respectively, (25.5 percent of the catch), over the same time period in block 308.

Current information indicates that shrimp trawling occurs in San Pablo Bay and into the Carquinez Strait, including waters near the Shell Terminal (Figure 4.4.1 – Major Commercial Fisheries). Fishing also occurs in waters less than 20 feet deep in the channels of the estuary's shallow reaches. Six trawlers harvest shrimp in north San Francisco Bay, San Pablo Bay, Petaluma Creek and the Carquinez Strait (Hieb 2005). Fishing occurs year round but landings usually peak during the months of June through November. Monthly variations in landings may have as much to do with changes in salinity in the water, as with fluctuations in demand by sport anglers (CDFG 2001).

Charter/Private Boat Sport Fisheries

Marinas near the Shell Terminal include Martinez, Crockett, Benicia, Glen Cove, and Vallejo. In Suisun Bay, Port Suisun, Suisun Marina, Pierce Harbor, Solano Yacht club, Harris Yacht Harbor and McAvoy Yacht Harbor service sport boats. In all, eleven facilities provide launches and berths for charter and private boats.

Martinez Marina and Yacht Club are about .5 mile to the west of the Shell Terminal and related Refinery property. The marina is open year round and has a total of 425 slips; only 350 slips are currently available for lease or rent. About 50 percent of the active recreational boats are used for fishing. The marina harbors about 3 charter fishing boats and 10 oil spill response vessels. One of the response vessels is owned by Shell (Demeter 2005)

The number of available slips in the Marina is reduced due to siltation and damage from the 1988 Shell Martinez oil spill. On April 23,1988 a storage tank drain pipe ruptured and leaked 440,000 gallons of crude oil in the estuary. Two fishermen discovered the spill and the oil not only tainted nearby wetlands and shoreline in the Carquinez Strait, but also entered the Martinez Marina. The Marina was closed, docks and boats were contaminated and the local charter boat business closed down. More detail on effects of the spill is in Section 4.4.4, Impacts Analysis and Mitigation Measures, Impact FHS-10.

The city of Martinez is planning to address the siltation and damage problems by improving the facility and increasing its current capacity. The major improvements include dredging 35,000 cubic yards of silt, replacing boat docks and the bulkhead and possible construction of a ferry terminal.

Figure 4.4-2, Major Sport Fisheries, shows the Strait and Suisun Bay provide habitat for and support numerous fisheries including American Shad, Chinook salmon fry and shallow water fish.

Figure 4.4.1 – Major Commercial Fisheries

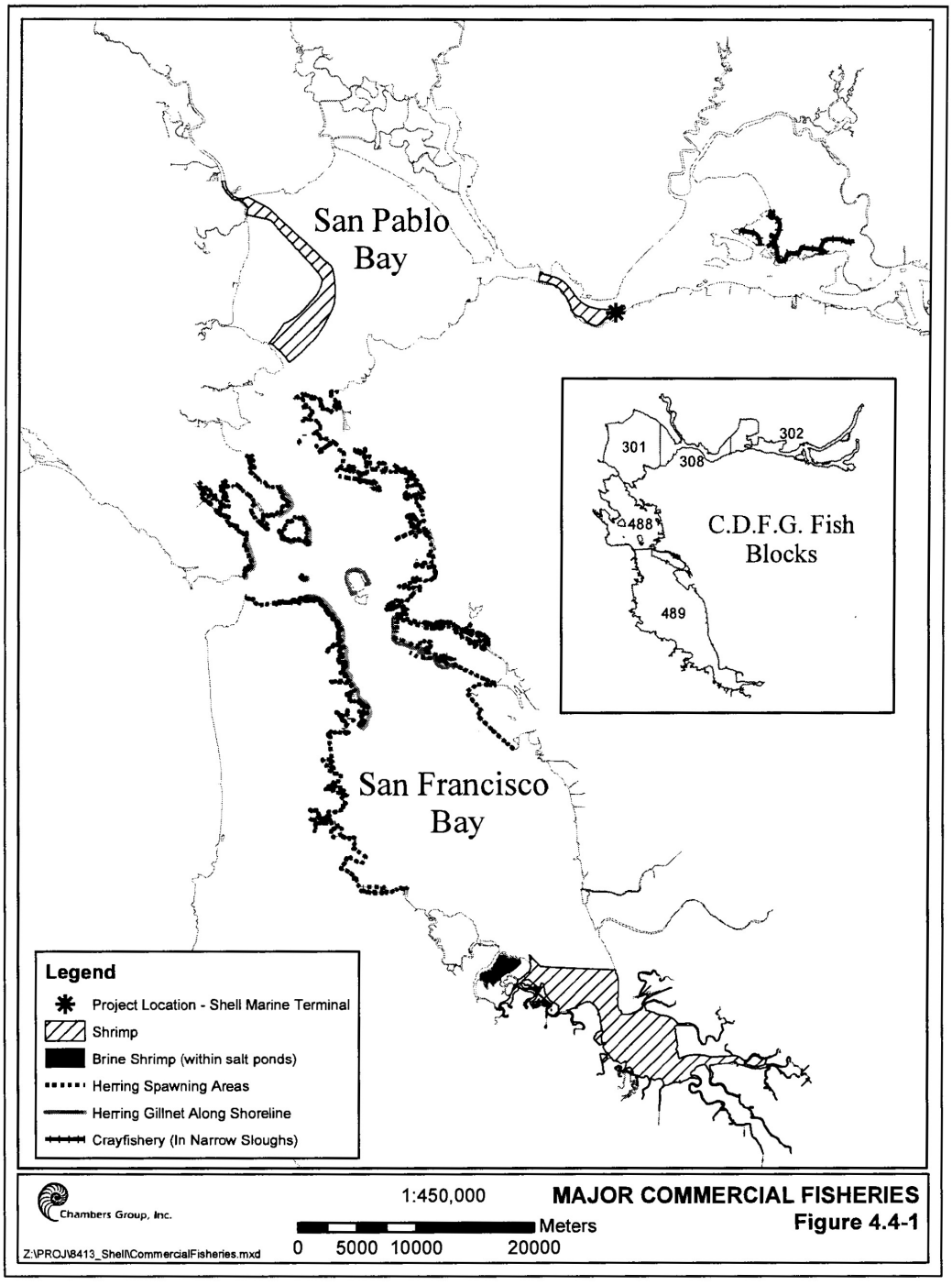
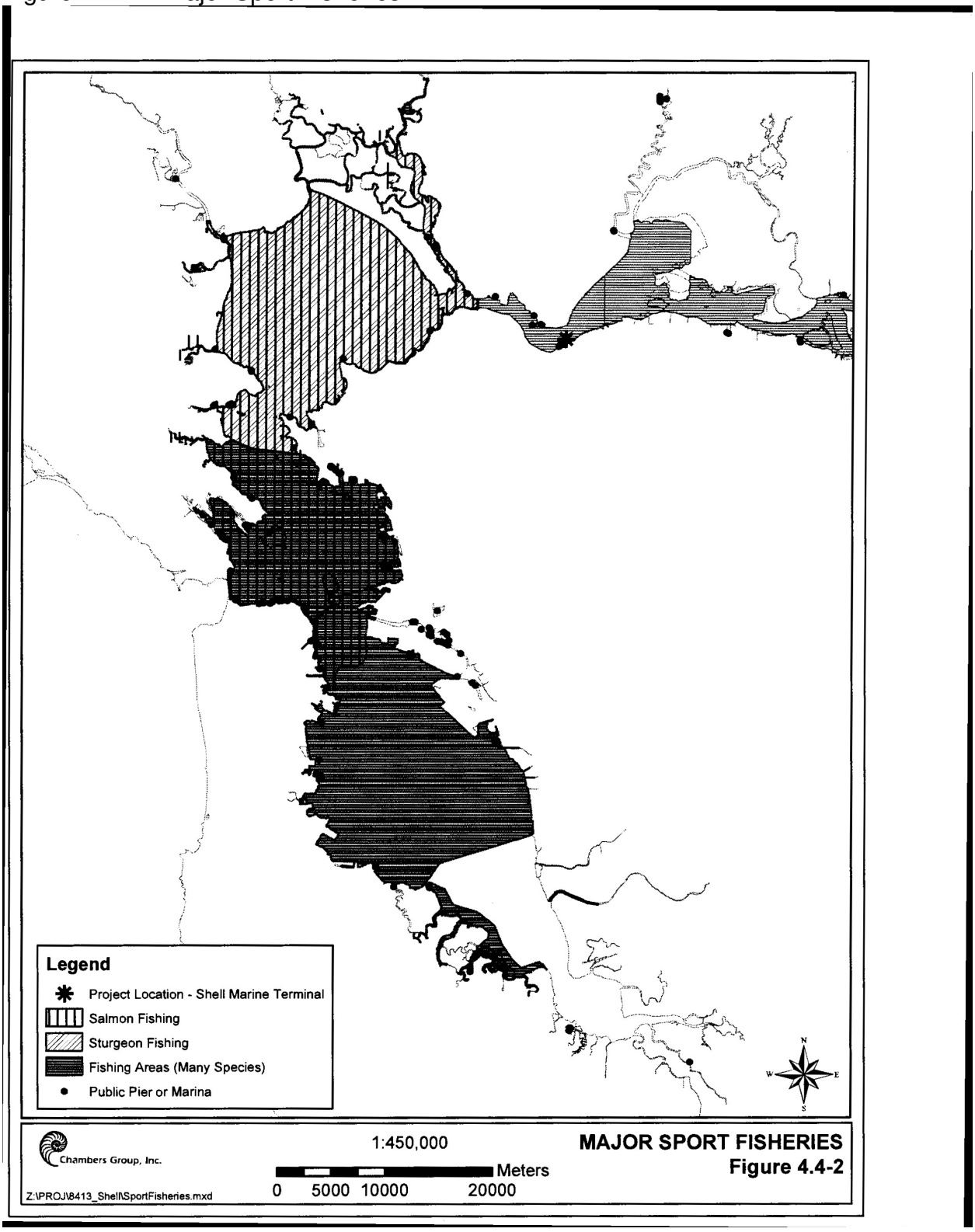


Figure 4.4-2 – Major Sport Fisheries



Recorded charter boat data for CDFG block 308 show that striped bass, sturgeon, spiny dogfish, Pacific crevalle jack and kelp bass are the most popular species caught in the area, making up 96 percent of the catch (Appendix C, Table C-1a). Compared to the rest of the Bay, charter boat activity is relatively light with sturgeon and striped bass the main fisheries of interest. Charter boats are most active out of Martinez Marina during sturgeon season, roughly October to April; Private boat anglers are expected to follow similar fishing patterns. Observations from the Shell Terminal and nearby marinas in June and July 2005 indicate that private boats occasionally visit the area.

Bay area boat anglers represent several ethnic backgrounds. In 2001 the California Department of Health Services (CDHS) and San Francisco Estuary Institute (SFEI) conducted a seafood consumption study and surveyed anglers throughout the Bay estuary. The results of the survey are summarized in Chambers Group 2004 and in Table 4.4-1. Vallejo Marina was the nearest survey site for private boat anglers.

Table 4.4-1
Ethnic Backgrounds of Surveyed Anglers

Sites	African/ American		Latino/ Hispanic		Caucasian		Asian		Other/ Unknown		Total	
	N *	%*	N	%	N	%	N	%	N	%	N	%
Vallejo Marina	7	5	12	9	86	63	19	14	13	10	137	100
Vallejo Waterfront	19	21	11	12	27	29	30	33	5	5	92	100
Martinez Shoreline Park	1	2	2	4	39	76	7	14	2	4	51	100
Total	27	10	25	9	152	54	56	20	20	7	280	100

***N = Numbers of interviews; % = row %.**
Source: SFEI, 2001.

Pier and Shore Fishing

Public piers, shoreline, and beach areas that provide access for fishing are located throughout the Bay Area; however, access to the open water in the immediate area of the Shell Terminal is limited. Most shoreline access is provided in or near marinas and on or near several piers. Piers and public shoreline areas near the Shell Terminal include Martinez Marina, Martinez park and public pier, 9th Street Park and pier in Benicia, Benicia Marina and pier, Benicia State Recreation Area, Crockett Marina and Dowrelio Pier, and Vallejo fishing pier and shoreline parks. Anglers have been known to catch flounder, sturgeon, shad, salmon, steelhead, and striped bass from these areas (California State Coastal Conservancy 1995). The Martinez public pier is popular with shoreside anglers going after sturgeon and striped bass. The largest recorded sturgeon, which weighed 468 pounds when caught in the Carquinez Strait in 1983 (CDFG 2001) is mounted at the Crockett Historical Museum.

The seafood consumption study also surveyed landside anglers at Vallejo Waterfront and Martinez Shoreline Park. Chambers Group 1994 and Table 4.4-1 summarizes the data from the two areas.

Surveyed boat and shoreside anglers ate white croaker (38 percent of anglers), leopard shark (37 percent) and striped bass (24 percent) caught in the estuary. Two percent of anglers targeted and consumed sturgeon and about 1 percent of anglers targeted and consumed jacksmelt, halibut and starry flounder (Ujihara 2002).

Future Trends

Commercial Fisheries

Expectations for the shrimp fishery remain as they are now; most of the product is used for angler bait, and little is reserved for human consumption. The market is not expected to change much over the next 20 years. Shrimp populations appear to vary widely from year to year. Studies show that abundance of California bay shrimp increases with increased river inflow to the estuary, probably because juvenile shrimp favor low-salinity habitat. Harvest management is limited to compiling logbook data and monitoring species composition in Bay shrimp landings. Catch limits, closed seasons or restricting harvest in areas are not considered necessary by fisheries regulators because the limited demand maintains fishing effort at levels which would not threaten long-term sustainability of the species. If freshwater inflows increase due to upstream fishery restoration efforts there may be a beneficial effect on the shrimp fishery (CDFG 2001).

Sport Fisheries

Demand for recreational fishing, in general, may increase as the Bay Area population increases. However, recreational fisheries are on a general decline. As with commercial fisheries, recreational fishing growth is limited more by the supply of healthy fish than by demand. Therefore, if the Bay's condition significantly improves, recreational fishing will likely grow. The reverse situation is also possible.

Sturgeon annual harvest estimates show that angling regulation changes begun in 1990 are reducing harvest rates by about 50 percent of the levels seen in the 1980s. Despite the decreased fishing effort, sturgeon populations vary greatly over the years. The highest estimate of 142,000 fish was in 1997. Annual fish populations vary due to changes in high spring fresh-water outflows from the Delta and scientists attribute the high population levels to the very wet 1982-1983 period. Conversely, experts note the severe 1987-1992 drought adversely affected reproductive success and caused a substantial decline in the adult sturgeon population, as recruitment nearly ceased and reduced growth rates and mortality limited the abundance of fish in the harvestable population. Subsequent wet water years have triggered another cycle of increased populations as fish from 1993 and later years mature (growth to adult maturity takes about nine to sixteen years) and enter the fishery. Charter boat catch statistics for block

308 mimic these trends. In 1998 – 2000 only 85 sturgeon were caught, compared to 561 caught during 2002 – 2004 (Appendix C, Table C-1b). Experts expect that no future angling restrictions are needed, due to low harvest rates, past rapid recoveries from population lows and current protection of the most fecund females by the 72-inch maximum size limit (CDFG 2001).

The recreational salmon fishery is expected to remain unstable due to watershed and Bay-Delta degradation, fluctuations between drought and wet years, and listing of species as either Endangered or Threatened pursuant to Federal and/or State Endangered Species Acts. Three emerging trends may prove hopeful for the fishery. Ocean fishery management quotas are growing stricter. Restoration in the Sacramento and San Joaquin watersheds, including the Delta and the Bay, is increasing as more financial resources are devoted to improving habitat. Restoration efforts may be paying off because salmon populations are on the rise. Lastly, negotiations over increasing water flows from upstream water developments and diversions in the rivers and Delta are on going. If these efforts are successful, beneficial effects may be seen in 10 to 20 years.

As with salmon, the future of the striped bass fishery is uncertain. The fishery's future depends on present efforts to successfully screen water diversions, to succeed at hatchery programs and to deal with population declines that may be caused by invasive species, pollutants and Bay-Delta water exports.

San Francisco and San Pablo Bay Fisheries

Commercial Fisheries

Shrimp

San Francisco Bay and brine shrimp fishing occurs year round. In 1965, this fishery was developed to supply Bay shrimp as live bait for sturgeon and striped bass sport fishing. A small percentage of catch is still consumed fresh. The commercial harvest has been entirely by beam trawl; live tanks are used on all vessels and shrimp are transported to local bait shops by truck in either the tanks or iced-down wooden trays. Staghorn sculpin, yellowfin goby, and long jaw mudsucker are also caught and sold by shrimpers.

Key fishing locations include South Bay, northwestern San Pablo Bay and Carquinez Strait (Figure 4.4-1). Fishing also occurs in waters less than 20 feet deep in the channels of the estuary's shallow reaches.

Currently, the number of vessels harvesting shrimp ranges from to 8 to 10. Three trawlers fish in the South Bay, 6 in the North and San Pablo Bays and 1 roams throughout the estuary (Hieb 2005). From 1991 - 2003, recorded landings for San Francisco Bay Area ports totaled 14.9 million pounds and averaged 1.1 million

pounds per year. From 2000 to 2003, landings were less than the longer term average and ranged from more than 972 thousand pounds to more than 607 thousand pounds. (CDFG 1991-2004).

Pacific Herring

Pacific herring spawning locations change from year to year and seem to favor areas that are less saline. During the 2005[1] season herring spawned along the shoreline from Point San Pablo to San Francisco Bay Bridge, at Robert Crown Memorial State Beach in Alameda, San Francisco, South San Francisco, Burlingame, Richardson Bay, Fort Baker, Sausalito, Belvedere Cove, Point San Quentin, and on Elephant Rock (State of California 2005a). The fish target hard surfaces (such as docks, piers, pilings) and Bay vegetation, such as eel grass. The San Francisco Bay Pacific herring harvest occurs during spawning season, generally from December through March, until quotas are filled. The focus of the herring harvest is the roe, which is exported to Japan. Fishing is conducted mainly with gillnets (CDFG regulations phased out use of round haul nets); a few fishing interests use the roe-on-kelp method. Kelp is harvested from southern California and hung from barges in the Bay; herring spawn on the kelp, which is then landed and processed.

Over the last 10 years, most herring fishing has occurred in CDFG block 488 (central San Francisco Bay), according to CDFG. However, herring spawn and a portion of the fishery occurs in the South Bay, especially during years with higher than normal rainfall.

Herring fisheries are highly managed by CDFG through the use of area closures, timing and gear restrictions, and quotas. Regulations change annually based on the previous year's estimates of spawning biomass. Currently, CDFG allows harvest of about 10 percent of the previous year's spawning biomass. (State of California 2005a).

The San Francisco Bay Pacific herring fishery experiences annual ups and downs (ranging from nearly 23 million pounds landed in the 1997 season to 290,000 pounds in the 2005 season), although on average, it is the largest commercial fishery within the Bays. The herring fishery has been important in terms of San Francisco area port landings (43 percent of total landings in 2000) and is important from a statewide perspective as well. In 2000, herring landings (6.4 million pounds) were the tenth highest in California, representing over 1 percent of all landings in California and nearly all were caught in San Francisco Bay.

Since the 1997-98 El Niño herring spawning populations have declined well below long-term averages. As a result, the fishery has landed far fewer fish than allowed by CDFG since the 2002 season. The populations may be on the rebound since the current

1 The San Francisco Bay herring fishing seasons span two calendar years. For purposes of this report, the seasons are represented by the latter year. For example, year 2005 represents the harvest season of 2004 – 2005.

spawning biomass estimate shows a 71 percent increase over 2004 estimates. The latest estimate exceeds the long-term average, following seven consecutive seasons of below-average spawning numbers (State of California 2005a). In the 2005 season, a total of 417 permits for San Francisco Bay (down from 440 during the 2002 season) were issued by CDFG (Moore 2005).

Other Fisheries

Small commercial fisheries also exist for finfish and shellfish, including white croaker, halibut, rockfish, salmon, shark, and Dungeness crab. The Bay is also a nursery area for Dungeness crab, an important ocean commercial and sport fishery north and south of San Francisco Bay. The Bay Institute reports good news for the fishery: the number of young Dungeness crabs in the estuary is on the rise. The recent increase in abundance may be related to improved ocean conditions, as well as efforts to reduce pollution and restore tidal marsh habitat in the Bays (The Bay Institute 2005).

Sport Fisheries

The Bays support a wide variety of fishes for sport fishing opportunities including charter fishing, private boat fishing, pier fishing, and beach/shore fishing. As shown on Figure 4.4-2, over 100 boat launches, anglers use marinas, and piers. The most popular game fishes caught in the Bays are striped bass, Chinook salmon and sturgeon. While most salmon fishing occurs in the ocean outside the Golden Gate, striped bass is caught through-out the estuary and sturgeon fishing concentrates in San Pablo Bay, portions of South Bay and points east. Surfperch, halibut, Bay shrimp, smelt, rockfishes, sharks, rays, clams, and others also offer great fishing opportunities to Bay Area anglers (California State Coastal Conservancy 1995).

Between 1989 and 2003, the number of charter boats operating out of San Francisco Bay ranged from a high of 93 to a low of 44, averaging 59 over the 15 years. In 2003, charter boats operating in San Francisco Bay and the Delta numbered 44, total number of anglers was 52,747 and they caught a total of 150,031 fish (State of California 1989-2004).

Bay area boat anglers represent several ethnic backgrounds. Caucasians made up 39 percent of those interviewed (1,331), while Asians made up 33 percent, Latinos/Hispanics made up 13 percent and African Americans totaled 9 percent. By far, most were English speaking (88 percent), followed by Spanish (4 percent), Vietnamese (3 percent) and Cantonese (1 percent) (SFEI 2001). Throughout the estuary, striped bass was targeted and eaten by 55 percent of anglers, while 23 percent focused on halibut, 18 percent preferred jack smelt, sturgeon and white croaker and about 4 percent ate salmon caught in the estuary (CDHS 2001).

Outer Coast: Oregon Border to Mexico

The following information summarizes and updates outer coast fishing descriptions in Chambers Group 1994 and 2004.

Commercial and Sport Fisheries

Commercial fisheries are generally described using port landings for all ports in California, including those in Eureka, San Francisco, Monterey, Santa Barbara, Los Angeles, and San Diego. Collectively, these ports reported a total of 4.9 billion pounds of fish taken from 1989 through 2000. For sport fisheries, in northern California, a total of 72.9 million finfish were reported taken by surveyed anglers from shore, party boats, and private boats from 1989 to 2001. For the same years in southern California, 163.7 million finfish were reported caught by surveyed anglers.

Marine Aquaculture and Kelp Harvesting

There are 41 registered marine aquaculture facilities along the California coast and marine aquaculture leases totaled 11 in 1998. As of 2001, seven kelp bed lessees leased 24 kelp beds totaling 32.56 square miles from Ano Nuevo (San Mateo County) to San Diego.

4.4.2 Regulatory Setting

Fisheries[2] depend on a healthy environment and responsible human activities to survive and flourish. This section focuses on the two general types of regulatory tools used to help ensure responsible human activities: controls on human development and resource harvesting management. Development can have a deleterious effect on the harvested resource or harvesting activities. Estuaries are complex and fragile and as such are imperiled by their proximity to intensive human activity and development. Long-term degradation of California's estuaries has been caused by sewage, industrial waste, dredging, filling of marshes and tidal flats, oil development and spills and degradation of upstream areas. In addition, environmental harms from non-indigenous or invasive species have increased exponentially in recent years (CDFG 2001).

Coastal zone development is regulated by the San Francisco BCDC and the CCC. BCDC develops and implements plans for the conservation and development of San Francisco Bay waters and regulates shoreline development, including commercial and recreational fishing facilities. The CCC, which has authority along the coast (excluding San Francisco Bay), helps ensure that the biological productivity of coastal resources is maintained, enhanced and restored for commercial, recreational, scientific, and educational purposes. It ensures that onshore commercial and recreational fishing facilities are protected and, where feasible, upgraded.

[2] Fisheries are defined, by broad definition of the Federal Fishery Conservation and Management Act (FCMA), as fish, their habitat, and fishing activities.

The CSLC manages and protects important natural resources and uses on public lands, including tidelands. Commercial and recreational fishing, kelp harvesting, and aquaculture are all considered important uses by the CSLC. Permits are issued for development on tidelands, and mitigation is often required to help protect natural resources and access to those resources.

Other agencies with authority to regulate development and ensure protection of aquatic resources include the EPA, the USACE, the USFWS, and State and RWQCB.

Fisheries, aquaculture, and kelp harvesting are overseen by several State and Federal agencies, including the CDFG, Federal Secretary of Commerce, the Pacific Fisheries Management Council, and NOAA Fisheries. If resources are adversely affected to the extent that productive habitat or populations are reduced, harvesting managers will likely respond by limiting harvests. A key example is the salmon fishery and fish declines attributed to timber harvest practices and inland water development.

4.4.3 Impact Significance Criteria

An impact would be considered adverse and significant if:

- Project activities temporarily reduce any fishery in the Bay, Straits or along the outer coast by 10 percent or more during a season, or reduce any fishery by 5 percent or more for more than one season;

- Project activities affect kelp and aquaculture harvest areas by 5 percent or more, or

- Lost harvesting opportunities due to harbor closures, impacts on living marine resources and habitat, and equipment or vessel loss, damage, or subsequent replacement could occur.

These significance criteria are used in a number of offshore development EIRs and are considered appropriate because commercial and recreational fishing businesses operate on slim profit margins. Relatively small reductions in fishing combined with closures of harbors and marinas could have large economic repercussions.

Assumptions for Assessing Fisheries Impacts

To determine the impacts associated with routine operations over the next 30 years, the following assumptions were made:

- The analysis considers vessel movement and operations for the Shell Terminal only;

- The Shell Terminal is expected to continue operating 24 hours a day, 365 days a year. The wharf portion is 40 feet wide and 1,950 feet long. It is connected to shore by a 1,900 foot long elevated trestle carrying a 16 foot wide roadway. A forty-foot wide pipe rack parallels the roadway. From 1999 to 2005 tankers and barges made,

on average, a little over 2 vessel calls per week, totaling an average of 196 vessel calls per year. Vessel calls to the Shell Terminal over the 30 year life of the CSLC lease could increase to 330 tankers and barges per year. The additional vessels would increase the number of calls to 4 to 5 per week;

- Vessels approach the Shell Terminal from Bulls Head Channel traversing through CDFG blocks 488, 301 and 308. The length of the vessel route from the Golden Gate to the Shell Terminal is about 30 miles. A one-way trip through the Bay to the Shell Terminal takes a vessel, on average, 3 hours. Roundtrip vessel transit times within the San Francisco Bay Estuary for 196 vessel calls currently average about 34 days per year or about 9.3 percent of the time available during a year. Over the next 30 years roundtrip transit times could increase to 82.5 days or about 23 percent of the time available during the year;

- Tankers stay at the Shell Terminal an average of 32 to 40 hours while barges "hotel" an average of 12 to 20 hours per visit;

- The Shell Terminal can accommodate vessels no longer than 1,000 feet long;

- Fishing operators normally navigate a safe distance from an obstacle to avoid collision and entanglements. A 0.25-mile buffer around transiting vessels and a 0.5-mile buffer around the Shell Terminal are used for all fisheries; and

- Space use impacts are based on comparing the size of the buffers at the Shell Terminal and around transiting vessels to the aerial extent of mapped fishing areas in CDFG blocks 488, 301 and 308. It is assumed that fish catches are evenly distributed within the mapped fishing areas.

4.4.4 Impacts Analysis and Mitigation Measures

4.4.4.1 Routine Operations at the Shell Terminal and by Transiting Vessels

Impact FSH-1: Space Use Conflicts Between Fisheries and Shell Terminal Operations

Commercial trawling near the Shell Terminal is limited, although the Carquinez Strait shrimp fishery is located in the direct vicinity of the Shell Terminal. Based on the impact significance criteria, space use impacts on the shrimp fishery are expected to continue to be significant and Class II. Space use conflicts between sport fishing and continuing Shell Terminal activities are considered to be adverse, but less than significant (Class III).

Shell Terminal operations occur in CDFG block 308 and the prominent commercial fishery is the shrimp trawl fishery. The Carquinez Strait trawl grounds hug the south shore of the Carquinez Strait and their eastern terminus is the Benecia Bridge. The Shell Terminal and 0.5 mile buffer will continue to take up about 1.5 square miles of the

2.6 square mile fishing area. Shrimp landings have historically been low, 21,000 pounds or about three percent, when compared with landings over the last 14 years (1991 – 2004) from other areas of the Bay Estuary. Routine operations at the Shell Terminal will continue to cause significant (Class II) space use conflicts (preclusion impacts) with commercial shrimp trawling, although effects on overall Bay shrimp landings will be small, because shrimping activity in the Carquinez Strait is light.

Boat and shore side anglers target striped bass, spiny dogfish, sturgeon, smelt, flounder, shad, salmon and steelhead. Over the next 20 years fishing patterns are expected to change little, if at all. With regards to sport fisheries, the waters surrounding the Shell Terminal support American shad, Chinook salmon fry and shallow water fish habitat for numerous species. The 0.5-mile buffer excludes less than 5 percent of the sport boat fishing area in block 308 and no shoreline fishing occurs within 0.5 mile of the Shell Terminal. Space use conflicts with commercial and sport fishing activities are considered to be adverse, but less than significant (Class III). Impacts related to vessels transiting the Bay are discussed in Impact FSH-5 through FSH-7.

FSH-1. Shell officials shall notify shrimp trawlers operating in Carquinez Strait of increases in vessel calls to the Shell Terminal. Shell Terminal officials shall work with shrimp trawlers to avoid conflicts between fishing and normal Shell Terminal operations. In addition, Shell shall inform incoming vessel operators of shrimp trawling activities near the Shell Terminal.

Rationale for Mitigation: By providing information to shrimp trawlers and vessel operators, potential space use conflicts may be avoided. Impacts would be reduced to less than significant.

Impact FSH-2: Impacts on Fish and Habitat from Discharge of Ballast Water

Fisheries depend on a healthy environment to survive and flourish. Invasive species discharged from ballast water could impair water quality (Impact WQ-2) and biological resources (Impact BIO-4). These impacts to fisheries resources would impair commercial and sports fishing activities in the Bay and outer coast, resulting in significant adverse impacts (Class I).

Impacts on fish and habitat will likely continue from discharges of ballast water, stormwater runoff, and maintenance dredging. Section 4.2, Water Quality (Impact WQ-2), concludes that discharges of ballast water from tankers at the Shell Terminal may contain harmful microorganisms that could impair fishing activities, estuarine habitat, fish migration, preservation of rare and endangered species, and fish spawning. Section 4.3, Biological Resources (Impact BIO-4), concludes that these invasive species impair estuarine habitat, benthic habitat, destabilize food webs by out-competing Dungeness crabs, striped bass and other species, and poison fish due to high concentrations of toxins, and cause fish kills. Recently expressed concern for the alarming declines of striped bass, longfin smelt and other pelagic organisms in the

Bay-Delta implicates invasive species as a possible cause of those declines. The published Delta Smelt Action Plan states that ship ballast water is considered one of the major ways that foreign species are transported and spread throughout the estuary (State of California 2005). Recent introduction of non-native invasive species, such as the Asian clam and cyclopoid copepod, may compete with native zooplankton and fishes, and may reduce available food for estuarine species. Asian clams also tend to concentrate pollutants such as selenium and organotins in their tissues. Fishes that feed on the Asian clam may have the potential to ingest quantities of toxins. The cyclopoid copepod may not only be a poor food source, it may be a predator of native copepods that are good food sources for other estuarine species in the food chain. Fish depend on health habitats to survive and reproduce; and productive commercial and recreational fisheries and inextricably linked to health habitats (NMFS 2005). Invasive species' adverse effects on fish and habitat have the potential to impair sport and commercial fisheries in the Bay and on the outer coast and likely cause significant adverse impacts (Class I).

Mitigation Measures for FSH-2:

FSH-2a. Shell shall: (1) carry out MM WQ-2 for segregated ballast water reporting for each vessel and (2) distribute advisories about the California Marine Invasive Species Act and disposal of non-segregated ballast water.

FSH-2b. Implement BIO-4b that requires Shell participate and assist in funding ongoing and future actions related to invasive species and identified in the October 2005 Delta Smelt Action Plan (State of California 2005).

Rationale for Mitigation: MM WQ-2 provides an interim tracking mechanism, advisories to tanker operators and prohibits disposal of -segregated ballast water until a feasible system to kill organisms in ballast water is developed. Measure FSH-2b requires Shell to contribute to a solution to problems caused by invasive species. The cooperative effort between CSLC and the DWR and CDFG would acknowledge and take advantage of the responsibilities of the Action Plan lead agencies and the responsibility and expertise of CSLC in administering the Marine Invasive Species Act of 2003.

Residual Impacts: The discharge of ballast water to San Francisco Bay commercial and sports fisheries will remain a significant adverse impact.

Impact FSH-3: Contamination from Stormwater Run-off from the Shell Terminal and Vessel Hull Anti-Fouling Paints

Shell routine operations contribute to contamination of waters near the Shell Terminal, but impacts on sport and commercial fisheries are expected to be adverse, but less than significant (Class III).

Shell routine operations contribute to contamination of waters near the Shell Terminal. Impacts WQ-7 and WQ-9 conclude that this contamination from vessel hull anti-fouling paints and stormwater runoff are significant (Class I and II, respectively); however, the contamination is low when compared to other pollutant sources in the Bay. Impact BIO-5 concludes that effects on benthic habitat and fishes is adverse, but less than significant (Class III). Because the Shell Terminal area is not considered a "hot spot" (and unlikely to be an area that fishing interests would avoid) and impacts on habitat and fish are expected to be low, effects on sport and commercial fisheries are expected to be adverse, but less than significant (Class III).

FSH-3: No mitigation is required.

Impact FSH-4: New Dredging at Berths #3 and #4

Over the 30-year lease, Shell may dredge berths #3 and #4 to accommodate more vessels. This dredging is expected to cause significant, but mitigable, impacts on fish habitat (Class II).

Within the Shell Terminal buffer new dredging at Berths #3 and #4 may harm or destroy American shad and other shallow water fish habitat. This loss or damage to habitat may affect fishing success among anglers. Impacts are expected to be significant (Class II).

Mitigation Measures for FSH-4:

FSH-4. Implement MM BIO-3a and MM BIO-3b.

Rationale for Mitigation: Avoidance of the times of the year when Dungeness crab and Chinook salmon smolt are present would reduce impacts to less than significant. These dredging windows are consistent with those of the Management Plan for the LTMS Placement of Dredged Material in the San Francisco Bay Region (USACE, USEPA, BCDC, SFBRWQCB 2001). If dredging cannot be conducted during the required dredging windows then Shell shall consult with the resource agencies as required by the LTMS Management Plan. Impacts would be reduced to less than significant.

4.4.4.2 Vessel Transits Through the Bay and Along Outer Coast

Impact FSH-5: Space Use Conflicts Between Bay Shrimp Fishery and Transiting Vessels

Space use conflicts between transiting vessels serving the Shell Terminal and shrimp trawling is expected to be significant (Class II) due to temporary, but ongoing, blocking of trawl grounds while vessels transit through the Carquinez Strait.

In the Carquinez Strait, vessels servicing the Shell Terminal would be expected to continue transiting directly through the shrimp trawl grounds. Due to the location of the trawl grounds, area available to transiting vessels and the 0.25 mile buffer, shrimp trawlers would likely continue to avoid fishing in the vicinity of a transiting vessel during its journey through the Strait. The vessel transit route would continue to block nearly all of the 2.7 square miles of shrimp trawl area for the next 30 years and about 0.35 square mile (or about 13 percent of the trawl grounds) would likely be blocked at any one time, as a vessel steams through the area. However, the time factor that a vessel travels through the area must be considered. On average, a vessel would be in the fishery area about 24 minutes for a one-way trip. Round trip transit times through the shrimp fishing area would range from 4.5 to 11 days per year depending on the number of vessels servicing the Shell Terminal. Assuming shrimp trawling occurs year round, over the next 30 years, the shrimp fishery would be blocked about 1.2 percent to 3 percent of the time, resulting in an adverse, but less than significant impact (Class III). If fishing occurs 12 hours per day, the percentage of available fishing time trawl grounds would be blocked by transiting vessels would double to 2.4 percent to 6 percent, a significant impact (Class II).

Mitigation Measures for FSH-5:

FSH-5. Implement MM FSH-1, requiring Shell to notify shrimp trawlers of increased vessel calls to Shell Terminal, and to inform incoming vessels operators of shrimp trawling activities.

Rationale for Mitigation: By providing information to shrimp trawlers and vessel operators, potential space use conflicts may be avoided.

Impact FSH-6: Space Use Conflicts Between Bay Herring Fishery and Transiting Vessels

Space use conflicts between transiting vessels serving the Shell Terminal and commercial herring operators could occur resulting in interference or displacement of herring fishing activities. A significant impact could result (Class II).

Herring fishing and shipping activities, in particular, would likely conflict because vessels calling at the Shell Terminal would pass through active fishing areas, thus interfering with or displacing herring fishing activities. CDFG works with concerned parties to minimize conflicts; however, some fishing areas may be inaccessible. Herring fishing currently occurs predominantly within CDFG blocks 488 (Central Bay) and 489 (South Bay). In block 488, the fishing area currently totals nearly 18 linear miles. Fishing in South Bay takes up more than double the amount of area, about 40 linear miles. In all, herring fishing areas occupy about 56 linear miles compared to spawning habitat that occupies about 268 linear miles. In any year, fishing could occur anywhere in the habitat areas.

In block 488, shipping corridors used by vessels calling at the Shell Terminal pass through current herring fishing areas around Angel Island, off Alcatraz, and along portions of the Tiburon shore. In block 489, lightering operations at Anchorage 9 could continue to interfere with herring fishing operations. At any one time, a vessel would likely pass through about 10 percent of the fishing area for 13 percent to 24 percent of the time that fishing is occurring, and could result in significant impacts (Class II). In the future, impacts on herring fishing activities may vary because the fish change their spawning locations.

Mitigation Measures for FSH-6:

FSH-6. Shell shall notify the Pacific herring fishery during the herring season of vessel transits. Shell shall also participate in the Pacific herring commercial fishery annual public scoping and hearing process, part of CDFG's annual review of herring commercial fishing regulations.

Rationale for Mitigation: The use of notification during the three to four month herring season would serve as a warning system notifying herring fishing operators of the transiting vessels. This would enable them to better plan their activities in affected areas. This would reduce or avoid interference between transiting vessels and herring fishing activities. Participation in the CDFG review of herring regulations will help keep Shell officials up-to-date on space use conflict regulations and reduce or avoid potential conflicts between the Shell Terminal and Pacific herring fishing operations. If the annual review does not adequately address space use conflicts and they occur or are expected to occur during a fishing season, CDFG has the authority to quickly act by adopting emergency regulations to protect fish and wildlife resources, public peace, health and safety, or general welfare (Fish and Game Code Section 240).

Impacts would be reduced to less than significant.

Impact FSH-7: Conflicts Between Transiting Vessels, Bay Sport Fisheries and Martinez Marina Operations

Space use conflicts between sport fisheries in the Bay and transiting vessels serving the Shell Terminal are significant (Class II). Vessels transiting to and from the Shell Terminal do not contribute to siltation of the Martinez Marina, and are considered adverse, but less than significant (Class III).

As vessels continue to traverse the shipping channels, sport anglers would continue to temporarily lose about 2.8 percent (about 11.5 square miles, including the 0.25-mile buffer) of their fishing area throughout the Bay. Comments at the EIR scoping meeting raised the concern that transiting tankers present a hazard to recreational boating and fishing activities. When asked, the Martinez harbormaster noted during a later conversation that occasionally a recreational boat will be anchored and fishing in the

tanker transit path (Demeter 2005). The boats are generally ordered to move by the vessel operators. Although no accidents between recreational and Shell Terminal vessels have been reported, that potential exists and will increase as the number of vessels servicing the Shell Terminal increases, and as the marina increases its dock usage. Given that the two facilities are only about 0.5 mile apart, direct space use impacts for sport fishing and indirect safety impacts are expected to be significant, but mitigable (Class II).

Other comments at the hearing focused on siltation in the Martinez Marina how it may be caused, in part, by transiting tankers, barges and tugs servicing the Shell Terminal. Research of currently available information did not corroborate this concern and distribution and redistribution of sediments is a result of natural processes (see Impact WQ-1 in Section 4.2, Water Quality). Impacts to fisheries and to safety from transiting vessels on Martinez Marina operations are less than significant (Class III).

Mitigation Measure for FSH-7

FSH-7. Shell officials shall inform incoming vessel operators of sport fishing activities near the Shell Terminal.

Rational for Mitigation: The potential for direct space use conflicts on sport fishing and indirect safety impacts from accidents between sport fishing vessels and vessels servicing the Shell Terminal exists and is expected to increase as Shell Terminal vessel and recreational boat traffic increase during the 30-year lease period. Through increased communication between Shell Terminal and vessel operators, catastrophic accidents can be reduced or avoided. Remaining impacts would be reduced to less than significant.

Impact FSH-8: Space Use Conflicts Between Fisheries Along the Outer Coast and Transiting Vessels

Vessel operators handling crude oil and product may affect commercial or recreational fishing; space use conflicts are expected to be adverse, but less than significant (Class III).

Vessel operators handling Alaskan North Slope crude have voluntarily agreed to maintain a minimum distance of 50 nm offshore the mainland. Other product tankers typically follow routes at an average distance of about 15 to 20 miles from the coastline. Most fishing vessels operate within 50 miles of the California coast, so space use conflicts have been anticipated by the USCG. The USCG's navigation rules, together with modern navigation equipment and communication gear aboard vessels and tankers will continue to be used by operators to avoid conflicts and allow mariners to co-exist.

FSH-8: No mitigation is required.

4.4.4.3 Oil Spills in the Bay and Along Outer Coast

Impact FSH-9: Fisheries Impacts from Accidental Spills at the Shell Terminal or Along Bay Transit Routes

Shrimp, herring and sport fisheries in central and north San Francisco Bay, San Pablo Bay, Carquinez Strait, Napa River and Honker Bay are at highest risk of spill contamination. Depending on spill location, size, and water and weather conditions, areas upstream of the confluence of the Sacramento and San Joaquin rivers may also suffer harm. In addition, the Bay marinas, launch ramps and fishing access points may be threatened, contaminated or closed. Significant adverse impacts (Class I and II) to Bay commercial and sport fisheries would result from oil spill accidents originating at the Shell Terminal or from tankers transiting the coast that service the Shell Terminal.

Significant adverse impacts to fisheries will likely result from an accidental spill of crude oil or product that could occur in the estuary during the 30-year life of the proposed Project. The severity of the impacts will depend on the following: size of the spill, composition of the product, characteristics of the spill (instantaneous vs. prolonged discharge, surface vs. subsurface spill, and so forth), environmental conditions and effect of weathering on spill properties and effectiveness of response and clean-up operations. The risk of a spill occurring depends on the number of vessels servicing the Shell Terminal, among other factors.

The overall conclusion from Section 4.1, Operational Safety/Risk of Accidents, is that, based on the projected future maximum of 330 annual vessel calls, an average of 1.5 spills per year can be expected from the Shell Terminal. About half would be less than 1 gallon. The probability of a spill larger than 1,000 gallons is 4 percent or 1 spill every 25 years. The annual probability of a spill greater than 42,000 gallons (1,000 bbls) from the Shell Terminal is 1.2 percent. The probability of a tank vessel spill from a Shell Terminal-bound vessel transiting the Bay equates to one spill every 710 years.

Oil spill clean-up and response is fairly effective in containing a spill of 50 bbl or less. Although larger spills have a fairly low chance of occurring, when they occur fisheries would likely be impacted in many different ways: by physical presence of oil on water, fishing restrictions imposed by public agencies to ensure that no tainted seafood reaches consumers, harbor closures to keep oil in or out, spatial conflicts with clean-up operations, long and short-term biological effects on fish and habitat, changes in seafood markets due to public fears of eating contaminated seafood, fishing interests avoiding areas for fear of contaminating gear and catching tainted fish, fishing area closures forcing interests to other areas, thus crowding uncontaminated areas and reducing overall catches and public reluctance to return to an area for sport fishing after a spill. Greater detail on effects of spills on fisheries is in the EIR for Consideration of a

New Lease for the Operation of a Crude Oil and Petroleum Product Marine Terminal at Unocal's San Francisco Refinery at Oleum (Chambers Group 1994). A summary is provided below.

Fisheries at Greatest Risk

Chambers Group 1994 concluded that fisheries in the estuary that are especially vulnerable to oil spills are:

- Commercial shrimp (Carquinez Strait and eastern San Pablo Bay) and herring (central San Francisco Bay);

- Sport salmon, sturgeon, and bass (San Pablo, San Francisco Bays, Carquinez Strait and Napa River), western Suisun Bay fisheries, halibut and rockfish (central Bay), smelt (Tiburon, Angel Island and Berkeley Pier), perch (San Pablo and central Bays, Angel Island, Berkeley Pier, Tiburon) and clam beds (Richmond); and

- Herring spawning (southern San Pablo and central Bays, Oakland/Alameda).

In particular, Mare Island Strait and the Napa River are vulnerable to spills and support salmon, sturgeon and bass fishing, in addition to several fishing access facilities. Honker Bay and the Sacramento River have a high vulnerability to 10,000 bbl spills, however the risk of such a spill occurring is low.

Oil Spill Scenarios and Oil Spill Impacts

Chambers Group 1994, concluded that several modeled spills launched in different locations in the estuary, either at terminals or in shipping lanes, would likely cause impacts ranging from Class I to III on the various estuary fisheries, depending on location, size of modeled spill and season. The EIR based its conclusions on calculating the percentage of fishing area that would potentially be covered by the modeled spills. The percentage of the affected fishing areas were compared to the 10-percent impacts threshold explained in the impact significance criteria. The quantified impacts were assumed to be the minimum expected impacts because impacts on the fish and their habitat and economic impacts may be long term and are difficult to quantify.

In particular, the EIR modeled two 1,000 bbl spills at the east end of Carquinez Strait, from tankers near the Shell Terminal, in February (Scenario 5) and July (Scenario 6) (see Appendix B-1, pages B1-8 and B1-9). If a spill similar to Scenario 5 occurred, the Honker Bay crayfish fishery would likely suffer Class III impacts and Suisun Bay fisheries would likely suffer Class I impacts. If a spill similar to Scenario 6 occurred, Suisun Bay fisheries would likely suffer Class III impacts.

Section 4.3, Biological Resources, Impact BIO-6, provides detail on effects of modeled spills on fish and habitat. To summarize, Impact BIO-6 and Impact BIO-7 conclude that

spills from the Shell Terminal and elsewhere in the Bay would have significant adverse impacts (Class I and II) on plankton, the benthos (specifically Dungeness crab and eelgrass), anadromous fishes (salmon and steelhead trout), and fishes that spawn in the Bay, particularly Pacific herring and longfin smelt.

1988 Shell Martinez Oil Spill

Reports from the 1988 Shell Martinez oil spill provide some quantification of impacts from the nearly 14,000 bbl (440,000 gallon) spill that originated from a Shell Refinery oil storage tank. The Carquinez Strait, the western portion of Suisun Bay (up to Roe and Ryer Islands) and salmon and bass migration corridors were covered with oil. Over 150 acres of wetland and 11 miles of shoreline were contaminated. The local charter boat business was closed down, as was Martinez Marina (Mcclean 1989). Docks, boats and shoreline were contaminated, and no vessels could enter or exit the marina. Shrimpers and bass fishermen reported financial losses of $300 to $700 per day and a bait shop proprietor estimated a weekend sales loss of at least $2,000 (Michelson 1988). The Pacific Coast Federation of Fishermen's Associations claimed $9 million in fishery resource damages and $11.25 million in financial losses to commercial and recreational fishing operators (Grader 1988). Shell agreed to pay $19.75 million, overall, in spill related damages in 1989.

Oil Spill Response and Martinez Marina

Oil spill response in the vicinity of the Shell Terminal should be rapid due to berthing of 10 oil spill response vessels at Martinez Marina, about 0.5 mile from the Shell Terminal. One of the response vessels is owned by Shell. Comments at the EIR scoping hearing expressed concern that (1) siltation in the Marina would hinder oil spill response vessel rapid access to a spill, (2) that due to siltation, oil spill response vessels are moved out of berths during low tide and (3) requested that Shell pay for use of the harbor by the spill response vessels. As stated above in FSH-7, and as concluded in Section 4.2, Water Quality, Impact WQ-1, the Shell Terminal does not contribute to siltation of the Martinez Marina. Marina operators deal with this problem by moving the vessels within the Marina so they are not silted in. Shifting of boats in the Marina occurs rarely, only during an extreme low tide and does not seem to impair vessel response (Demeter 2005).

Response vessels pay dock rental fees like all other boaters who rent slips at the Marina and the vessel owners receive no special rates. Those fees go to the city of Martinez to pay for Marina operations and maintenance. Part of the maintenance involves dredging (Demeter 2005). It was reported at the scoping hearing that the main passages in/out of the Marina were recently dredged and that dredging generally occurs yearly.

Although the Marina berths several oil spill response vessels, there is no reference to the Marina's contribution to or important role as an oil spill response facility or deployment site for protecting nearby sensitive habitats, such as Martinez Marsh, Shell

Dock Marsh and other sites addressed in the Shell Terminal Oil Spill Response Plan, Section 6 "Sensitive Areas/Response Tactics." This lack of information may hinder or delay access to critical equipment, supplies and vessels during an emergency and is a significant impact. (Class II).

Conclusion

Significant adverse impacts (Class I and II) to commercial and sport fisheries in the estuary would result from oil spill accidents originating at the Shell Terminal or from transiting tankers that service the Shell Terminal. The extent of impact (Class I or Class II) would depend on the extent of damage and effectiveness of containment and rapid cleanup, and residual impacts. Shrimp, herring and sport fisheries in central and north San Francisco Bay, San Pablo Bay, Carquinez Strait, Napa River and Honker Bay are at highest risk of spill contamination. Depending on spill location, size, and water and weather conditions, areas upstream of the confluence of the Sacramento and San Joaquin rivers may also suffer harm. In addition the 140 marinas, launch ramps and fishing access points with the San Francisco Bay may be threatened, contaminated or closed.

Mitigation Measures for FSH-9:

The following mitigation measures shall be carried out by Shell Terminal officials to minimize the areas precluded to fishing during a spill and subsequent cleanup, and to help offset the losses to fishing interests and businesses dependent on fishing activities.

FSH-9a. Implement MM OS-3 and MM OS-4 in Operational Safety/Risk of Accidents, and MM BIO-6b through BIO-6d in Biological Resources, to lower the probability of an oil spill and increase response capability.

FSH-9b. Post notices at spill sites, marinas, launch ramps and fishing access points to warn fishing interests of locations of contaminated sites. Notices shall be written in English and Spanish, and be posted in areas most likely to be seen by fishing interests.

FSH-9c. If damages to fishing operations or related businesses occur, as a last resort provide financial compensation. Any losses shall be documented as soon as possible after a spill, using methods for determining damages established beforehand. Response for damage losses should include provisions for compensating operators and businesses as soon as possible.

FSH-9d. Following a spill, evaluate the effectiveness of oil spill mitigation measures used to respond to a spill caused at the Shell Terminal by tankers calling at the wharf. Results of the evaluation would be available to public decision-makers to ensure refinement, and if

necessary, modification of mitigation measures. Evaluation would be done only after an accident and would include monitoring using scientifically accepted protocols. Costs for the evaluation would be borne by Shell for spills caused at the Shell Terminal. Shell shall contribute to independent public or private organizations or oil spill research. Contributions would be determined in cooperation with the evaluating organizations, agencies, and the CSLC.

FSH-9e. Update the Shell Terminal Oil Spill Response Plan to prominently mention Martinez Marina as an oil spill response facility and deployment site and to list the available equipment, supplies and vessels available to Shell which are located at the Marina.

Rationale for Mitigation: For FSH-9a, the OS-3 measures would lower the probability of an oil spill by allowing for quick release of mooring lines (OS-3a), monitoring of tension of the mooring lines (OS-3b), allision avoidance (OS-3c), and developing a comprehensive preventative maintenance program (OS-3d). MM OS-4 requires Shell to identify procedures and equipment that can be used to improve their response to Group V spills in their Oil Spill Response Plan as new techniques and equipment become available. The BIO-6 measures provide protection of biological resources. BIO-6b requires Shell to identify a source of sonic hazing devices to scare birds away from a spill. When a spill occurs, BIO-6c requires Shell to develop procedures for cleanup of impacted sensitive resources working closely with the CDFG and USFWS. If damage occurs from a spill, BIO-6d requires Shell to document lost resources, and to develop a sampling plan for damage as a means to determine restoration and compensation. Posting of notices (FSH-9b) provides information to English and non-English speaking anglers to protect the public from contact with contaminated fish; providing compensation (FSH-9c) helps to pay for the costs of cleanup, and contributing to evaluations of the effectiveness of mitigation measures and contribution to oil spill research (FSH-9d) would help to refine such measures to increase effectiveness for future spill events. Updating the facility response plan (FSH-9e) to identify the Martinez Marina as a response facility and deployment site may reduce response time to a spill. These measures help to reduce spills and their associated impacts. However, the impacts associated with the consequences of larger spills, greater than 50 bbls, could remain significant.

Over the short term (less than a year) some fishing interests may not be compensated, and opportunities would be lost while fishing areas are inaccessible. These impacts may be especially acute for anglers who depend on fishing for a major source of food. Over the long term, impacts could result if, for example, areas remain closed due to contamination or public fears of eating contaminated fish result.

Residual Impacts: Impacts are expected to remain significant.

Impact FSH-10: Fisheries Impacts From Accidental Spills Along Outer Coast Transit Routes

Significant adverse impacts (Class I and II) to outer coast commercial and sport fisheries could result from oil spill accidents from transiting tankers calling at the Shell Terminal. The level of impact would depend on the size of the spill, location, and fisheries occurring in the area of spread of the spill.

Analysis for this section is taken from the Unocal EIR (Chambers Group 1994) and the Getty Gaviota Marine Terminal EIR (Aspen Environmental Group 1992). To summarize, Chambers Group, Inc. (1994) assessed impacts from two crude oil spill scenarios, 100,000 bbls each, one launched in March off the Farallone Islands and the other launched in October, southwest of Punta Gorda. Impacts ranged from adverse and significant to adverse but less than significant (Class I to Class III), depending on the location of the spills, location of the fisheries, and the number of harbors or shoreline access points affected. Impacts were assessed on commercial and recreational fisheries, aquaculture operations, and kelp harvesting activities in the area from Del Norte County to Monterey County.

Scenario 1 (Farallone Islands) caused significant adverse impacts (Class I) on commercial and recreational fisheries from Point Reyes to Monterey County and on aquaculture operations in Monterey Bay and off Santa Cruz. Significant adverse impacts that could be mitigated to less than significant (Class II) occurred to kelp harvesting from Point Montara to Monterey Bay. If vessels calling at the Shell Terminal cause similar spills, impacts on aquaculture operations would be more severe. In 1994, 4 operations would have been affected; in 2002 10 operations in Marin, San Mateo, Santa Cruz, and Monterey Counties would have been affected by a similar spill.

Scenario 2 (Punta Gorda) caused Class I and Class III impacts on commercial and recreational fisheries, no impacts on aquaculture operations, and Class II impacts on kelp harvesting. A similar spill from a tanker calling at the Shell Terminal would likely cause similar impacts.

Aspen Environmental Group (1992) assessed coast wide impacts from two spill scenarios that launched spills from the Santa Barbara Channel and Santa Monica Bay; both were 100,000-bbl spills.

The Santa Barbara Channel spill caused significant adverse impacts (Class I) on commercial and recreational fisheries in the Channel and less than significant impacts on fisheries located off Morro Bay and Los Angeles.

The spill caused Class I impacts on aquaculture operations, Class II short-term impacts, and Class III long-term impacts on kelp harvesting. Impacts from a spill caused by a vessel calling at the Shell Terminal are expected to be similar.

The Santa Monica Bay spill caused significant adverse impacts (Class I) on commercial fisheries off Los Angeles and on recreational fisheries off Santa Barbara, Ventura, and

Los Angeles Counties. The spill caused Class II impacts on aquaculture operations off Los Angeles, Ventura, and Orange Counties. Kelp harvesting operations were significantly affected (Class II) over the short term. Over the long term, kelp plants would likely recover and harvesting would resume, resulting in adverse but less than significant (Class III) impacts. A similar spill caused by a tanker calling at the Shell Terminal tanker would affect fewer aquaculture operations, because in 2002 there was only one operation left off Los Angeles County and none off Orange County. However, the two operations in Ventura and the one in Los Angeles County would still be affected by the spill, resulting in Class II impacts. Containment/response actions are discussed in Impact OS-7, Operational Safety/Risk of Upset.

Mitigation Measures for FSH-10:

FSH-10. Shell shall implement MM OS-7 for VTS upgrade participation and to provide immediate spill response near/at the terminal. Shell shall implement MM FSH-9b through FSH-9d to notify fishing interests of possible fishing areas to help offset the losses to fishing interests and businesses dependent on fishing activities, and to evaluate the effectiveness of mitigation measures.

Rationale for Mitigation: Significant impacts are likely to occur even with containment. OS-7 requires Shell to participate in any analysis that will examine upgrades to the Bay VTS, and to provide immediate response to a spill using its own equipment and resources, rather than waiting for mobilization and arrival of the vessel's response organization. The responsibility for vessels is not the responsibility of Shell for transiting vessels, however, posting of notices (FSH-9b) provides information to protect the public from contact with contaminated fish, providing compensation (FSH-9c) helps to pay for the costs of cleanup, and evaluating the effectiveness of mitigation measures (FSH-9d) helps to refine such measures and contributing to oil spill research helps to increase effectiveness for future spill events.

Residual Impacts: Residual impacts are expected to remain significant (Class I) for large spills.

4.4.5 Impacts of Alternatives

Impact FSH-11: No Project Alternative

The alternative would eliminate the fisheries impacts associated with operations at the Shell Terminal resulting in a beneficial (Class IV) impact. Fisheries impacts would be transferred to other marine terminals and would be similar to those expected for the proposed Project. Shell has no responsibility for those terminals.

Under the No Project Alternative, Shell's lease would not be renewed and the existing Shell Terminal would be subsequently decommissioned with its components abandoned in place, removed, or a combination thereof. The decommissioning of the Shell Terminal would follow an Abandonment and Restoration Plan as described in Section 3.3.1, No Project Alternative.

Under the No Project Alternative, alternative means of crude oil/product transportation would need to be in place prior to decommissioning of the Shell Terminal, or the operation of the Shell Refinery would cease production, at least temporarily. It is more likely, however, that under the No Project Alternative, Shell would pursue alternative means of traditional crude oil transportation, such as a pipeline transportation, or use of a different marine terminal. Accordingly, this Draft EIR describes and analyzes the potential environmental impacts of these alternatives. For the purposes of this Draft EIR, it has been assumed that the No Project Alternative would result in a decommissioning schedule that would consider implementation of one of the described transportation alternatives. Any future crude oil or product transportation alternative would be the subject of a subsequent application to the CSLC and other agencies having jurisdiction, depending on the proposed alternative.

Decommissioning and/or deconstruction of the Shell Terminal would cause temporary disturbance to fisheries habitat and nearby sport fishing resulting in short-term adverse, but less than significant impacts (Class III). In the long-term fisheries habitat would likely be reclaimed and more area would likely open up for sport fishing, resulting in a beneficial impact (Class IV).

FSH-11: No mitigation is required.

Impact FSH-12: Full Throughput Alternative

Shell's use of other marine terminals would transfer vessel operations, along with associated impacts to those terminals, and would eliminate the need for the Shell Terminal, resulting in a beneficial impact (Class IV). Impacts on fisheries from wharf modification, routine use and oil spills associated with other terminals and pipelines would range from Class I to Class III.

Terminal(s)

With this alternative, Shell Terminal operations would cease and be transferred to other Bay Area terminals. Assuming alternative terminals are located in San Pablo Bay, Shell Terminal related vessels would traverse through CDFG block 488 and affect 9 percent of the commercial herring fishery in the block, for about 16 percent of the herring season, constituting a significant (Class II) impact. Lightering operations in block 489 would likely be in addition to these impacts. Oil spill effects would be the same as described above for the proposed Project, (ranging from Class I to III). Impacts at and from the other terminals would likely be greater than those assessed for the proposed Project due to increases in expected capacity, including possible terminal modifications.

If no other terminals in Carquinez Strait are utilized, one advantage to this alternative is that fewer vessels would be traversing through the Carquinez Strait, lessening space use conflicts with shrimp and sport fishing activities.

Pipelines

Construction/operation/maintenance of pipelines could impact water crossings, and could cause erosion and siltation that may flow down rivers, creeks and sloughs and adversely impact Bay fisheries and habitat. Oil spills from pipelines can contaminate the Bay estuary, outer coast, groundwater or flow down river, creeks, and sloughs, harming fisheries and habitat. Impacts from pipeline construction, operation, maintenance, and accidental spills would range from Class I to Class III, depending on locations of the pipelines and the number of stream crossings.

Mitigation Measures for FSH-12

FSH-12a. The operators of the other terminals shall carry out MM similar to FSH-1 through MM FSH- 10.

FSH-12b. The pipeline operator shall carry out MM GEO-8 to address pipeline engineering and design. In addition, measures shall include: construction surveys to minimize hazards/impacts; establishing buffer zones; conducting worker training for construction/ maintenance in sensitive areas; confining activities to pipeline right-of-ways; planning for and minimizing disturbance at water crossings; measures to eliminate or minimize water and soil contamination; erosion control measures; pipeline burial and protection; floodplain protection; and, adequate oil spill response and planning.

Rationale for Mitigation: Impacts of routine operations at other terminals would likely be similar to the types of impacts projected for the proposed Project with similar mitigation measures. Mitigation measures for pipeline design and engineering (GEO-8) and other measures for construction/maintenance are required to avoid or minimize to the greatest extent possible, erosion and siltation that would adversely impact Bay fisheries. The MM GEO-8 also provides maximum protection against oil spills from pipelines, preventing Bay or outer coast contamination, or contamination of groundwater or flow down rivers, creeks and sloughs, and harm to fisheries and habitat.

Residual impacts: Residual impacts are dependent on the location of the terminal sand pipelines.

4.4.6 Cumulative Projects Impacts Analysis

Impact CUM FSH-1: Space Use Conflicts with Bay Fisheries

The cumulative projects would cause space use conflicts with the commercial shrimp, Pacific herring and sports fisheries, and result in significant (Class I and II) impacts. Shell's contribution to space use conflicts with the Pacific herring fishery ranges from Class I to Class III, depending on herring spawning locations, fishing operations and other factors.

Routine Operations

Shell Terminal

Operations at the Shell Terminal would continue in conjunction with port operations, navigation and bridge improvement projects, marina improvements, commercial and recreational development on old military properties and new ferry service; some projects would be located near the Shell Terminal. Cumulative impacts from harbor and shipping activities throughout the Bay, including impacts from Shell Terminal related operations, would range from Class I to Class III, as explained below.

Space use conflicts between the shrimp fishery and commercial and industrial activities in Bay harbors and at shipping terminals would continue and vary depending on the location and size of the fishing area and the level of disturbance from future development. For example, a new ferry service at Martinez Marina and the John F. Baldwin Navigation Channel Project may disturb or destroy shrimp habitat or preclude fishing access. Shell's contribution would be significant (Class II) (see Section 4.4.4, Impact Analysis and Mitigation Measures).

Sport fishing activities would continue throughout the Bay and the new developments may further preclude these activities. Depending on the mitigation measures, significant impacts would either be reduced to less than significant or would remain (Class I or III). Shell's contribution to the impacts would be Class III.

Transiting Vessels

Space use conflicts from shipping activities would continue. Marine vessels transiting through the Carquinez Strait to and from the Port of Benecia; ConocoPhillips Rodeo; Shore Selby and Pacific Atlantic; Tesoro Amoroco and Avon; C & H Sugar, Crockett; Valero, Benicia; PG&E Pittsburg; the Concord Naval Weapons Station and other terminals would continue to use the established shipping channels. These channels would continue to preclude access to fishing areas, but also serve to concentrate traffic so that other areas would continue to be available for fishing. Shell's contribution to the cumulative impacts on commercial shrimp, Pacific herring and sport fisheries from Bay Area transiting vessels is small, but adverse, (Class II). For example, tankers and

barges servicing the Shell Terminal totaled 218 in 2003. When compared to the total number of vessels entering the Bay (22,551 vessel calls in 2003, excluding tows and tugs), Shell Terminal related tankers and barges contribute to about .9 percent of the cumulative vessel traffic.

Mitigation Measure for CUM-FSH-1:

CUM-FSH-1. Shell shall implement MM FSH-1, MM FSH-5, MM FSH-6 and MM FSH-7 to mitigate impacts from routine operation of the Shell Terminal and related transiting vessels.

Rationale for mitigation: These measures require Shell to warn vessel operators of nearby shrimp and sport fishing activities, to participate in the CDFG annual review of herring regulations and to notify herring operators of vessel transits during the herring season. The measures will keep Shell up-to-date on space use conflict regulations enforced by CDFG and would serve as a warning system notifying fishing operators of transiting vessels. Shell has no responsibility for other vessels transiting through the Bay.

Impact CUM-FSH-2: Impacts on Fish and Habitat from Discharge of Ballast Water

In 2003, about 22,551 vessels (excluding tows and tugs), including 218 that called at the Shell Terminal, from outside the Golden Gate, have the potential to introduce invasive species to the San Francisco Bay Estuary and cause irreparable harm to fisheries and the ecosystem. In the future the problem could become greater if the number of vessels substantially increases. The significant adverse impact is expected to be Class I.

Invasive species, brought to the San Francisco Bay Estuary by vessels entering the Golden Gate, have been implicated as a possible cause of substantial declines in Delta smelt, longfin smelt and striped bass populations. Adverse impacts on fish or their habitat are expected to affect sport and commercial fisheries, since fisheries need a health environment to survive and flourish.

About 22,551 vessels in 2003 (see Table 4.4-1 in Section 4.4, Cumulative Related Projects) had the potential to bring invasive species to San Francisco Bay in ballast water or on the vessel hulls. Although compliance with the Marine Invasive Species Program is impressive, exceeding 95 percent, new non-native species can still invade the estuary and cause irreparable damage to Bay fisheries in the future (Class I impacts). Shell's continuing contribution to the problem is small, but adverse (Class I impact) and ranges from 0.6 percent, based on the number of vessels entering the Bay in 2003, to 6.25 percent based on the number of marine terminals in the Bay.

Mitigation Measure for CUM-FSH-2:

CUM-FSH-2. Shell shall comply with MM FSH-2.

Rationale for Mitigation: MM WQ-2 (MM FSH-2a) provides an interim tracking mechanism, advisories to tanker operators and prohibits disposal of non-segregated ballast until a feasible system to kill organisms in ballast water is developed. MM FSH-2b allows Shell to contribute to a solution for problems caused by invasive species. Shell's participation in the Delta Smelt Action Plan will keep company officials up-to-date on the causes of pelagic fish declines and the results of related invasive species studies and actions. Shell's financial contributions will go directly to actions that are seeking solutions to the problem of pelagic species declines attributed to introduction of invasive species. Shell's actions could serve as a model for other projects that would threaten the Bay by bringing invasive species in ballast water or on vessel hulls.

Residual Impacts: Introduction of invasive species to San Francisco Bay by transiting vessels servicing all terminals in the Bay will remain a significant impact (Class I) on commercial and sport fisheries. Shell's contribution to the problem will remain significant.

Impact CUM-FSH-3: Contaminant and Dredging Impacts on Fisheries

Shell's contribution to the San Francisco Bay Estuary of contaminants from stormwater runoff and anti-fouling paints is small when compared to discharges from other development. However, because contaminants (on a cumulative basis) have caused irreparable and adverse harm to the Bay, impacts to plankton and fish populations are significant per Impact CUM BIO-1. These cumulative impacts are likely significantly impacting sport and commercial fishing success (Class I). Cumulative impacts from dredging is expected to be significant, but mitigable (Class II).

Biological Resources, Section 4.3.6, Cumulative Project Impacts Analysis, concludes cumulative development in the Bay would pose: (1) Class I impacts on the benthos from shipping and channel dredging activities, (2) Class I impacts on fishes, in general, from discharge of contaminants in the Bay, (3) Class II impacts on Chinook salmon (endangered species), Dungeness crab and Pacific herring from dredging, and (4) Class III impacts on the benthos from discharge of contaminants. These cumulative impacts can adversely affect the viability of Bay commercial and sport fisheries. Shell's continuing contribution is small, but adverse because its discharges are vastly dwarfed by urban runoff and other industrial discharges, and in 2003 about 6 percent of all vessel calls in San Francisco Bay serviced the Shell Terminal. Cumulative impacts on fisheries from contaminants and dredging are expected to range from Class I to Class III.

Mitigation Measures for CUM-FSH-3:

CUM-FSH-3. Carry out proposed Project MM CUM-WQ-1 and MM FSH-4.

Rationale for mitigation: Shell's implementation of measures to decrease spill risk, increase response capability and prepare measures specific to the Shell Terminal in its SWPPP would help the Shell Terminal reduce its contribution of contaminants into the water, and thus help to reduce impacts to fisheries. The dredging "windows" in the LTMS per MM FSH-4 are designed to minimize impacts on fish, shellfish and habitat, and thus, limit significant impacts on those fish, shellfish and related fisheries.

Residual Impacts: Cumulative impacts on benthos and fishes would remain significant (Class I).

Impact CUM-FSH-4: Accident Conditions

Cumulative impacts on Bay and outer coast fisheries from harbor and shipping activity related oil spills, including those associated with the Shell Terminal and related vessels would range from Class I to Class III. Shell has no responsibility for vessels transiting the Bay or outer coast that are not associated with the Shell Terminal.

Spills Within the Bay

Generally, areas at highest risk from spills at terminals in the Bay (all terminals, including the Shell Terminal) are in the Carquinez Strait, southern Suisun Bay and near shore areas from Point San Pablo to Richmond. In addition, portions of the central Bay are at risk.

Tankering in the Bay has the potential to result in a greater geographical spread of oil. Generally, high risks would occur from the Carquinez Strait through eastern San Pablo Bay, into San Francisco Bay south to Alameda, and west to the Golden Gate. Fisheries in the central portion of the Bay (off San Francisco, Oakland, and Tiburon) are at an extremely high risk of contact with spilled oil (30 to 39 percent) and would result in significant, adverse (Class I) impacts. Greater detail on the fisheries at highest risk can be found in the Unocal EIR (Chambers Group 1994), Section 4.5.4 Impact Analysis and Mitigation Measures.

Spills Along the Outer Coast

Impacts from coastal oil spills would likely be significant, adverse (Class I) and similar to those described in Impact FSH-10. Vessels calling at the Shell Terminal contribute incrementally to the risk from vessels traversing the coast. The 218 vessels that called at the Shell Terminal in 2003 constituted about 6 percent of the coast wide tankers and barges that accessed San Francisco Bay. The percentage of Shell Terminal related vessels is expected to increase to as many as 330 over the lease period. Risks to

fisheries, aquaculture and kelp harvesting operations from vessels calling at the Shell Terminal would likely be similar to those assessed in the Unocal EIR (Chambers Group 1994), and would likely be significant (Class I).

Oil spill risk and resulting cumulative impacts of oil spills from Shell Terminal operations and other vessel activities would likely result in significant, adverse (Class I) impacts at local terminals, in the Bay, and along the outer coast.

Mitigation Measures for CUM-FSH-4:

CUM-FSH-4. Shell officials shall carry out MM FSH-9.

Rationale for mitigation: The measures that comprise MM FSH-9 would: (1) minimize impacts on fish habitat and resources; (2) minimize the areas precluded to fishing during a spill and subsequent cleanup; and (3) help to offset the losses to fishing interests and businesses depending on fishing activities. Shell would have no responsibility for accidents at other terminals or from vessels servicing other terminals or facilities.

Residual Impacts: Cumulative impacts from oil spills would remain significant (Class I) in the estuary and along the coast.

Table 4.4-2 summarizes the Commercial and Sport Fisheries impacts and mitigation measures.

Table 4.4-2
Summary of Commercial and Sport Fisheries Impacts and Mitigation Measures

Impact		Mitigation Measures	
FSH-1:	Space Use Conflicts Between Fisheries and Shell Terminal Operations	**FSH-1:**	Shell will notify shrimp trawlers of increased vessel calls to Shell Terminal. Inform incoming vessels operators of shrimp trawling activities.
FSH-2:	Impacts on Fish and Habitat from Discharge of Ballast Water	**FSH-2a:** **FSH-2b:**	MM WQ-2; Participate and assist in funding invasive species related actions in Delta Smelt Action Plan. Implement BIO-4b that requires Shell to participate and assist in funding ongoing and future actions related to invasive species and identified in the October 2005 Delta Smelt Action Plan (State of California 2005).
FSH-3:	Contamination from Stormwater Runoff and Vessel Hull Anti-Fouling Paints	**FSH-3:**	No mitigation is required.
FSH-4:	New Dredging at Berths #3 & #4	**FSH-4:**	Implement MM BIO-3a and MM BIO-3b to avoid the times of the year when Dungeness crab and Chinook salmon smolt are present.
FSH-5:	Space Use Conflicts Between Shrimp Fishery and Transiting Vessels	**FSH-5:**	MM FSH-1.
FSH-6:	Space Uses Conflicts Between Herring Fishery and Transiting Vessels	**FSH-6:**	Notify Pacific herring fishery of vessel transits; Participate in Pacific herring annual public scoping and hearing process, managed by CDFG.
FSH-7:	Conflicts with Transiting Vessels, Bay Sport Fisheries and Martinez Marina Operations	**FSH-7:**	Inform incoming vessel operators of sport fishing activities near the Shell Terminal.
FSH-8:	Space Use Conflicts Between Fisheries and Transiting Vessels Along Outer Coast	**FSH-8:**	No mitigation required.
FSH-9:	Fisheries Impacts from Accidental Spills at Shell Terminal or along Bay Transit Routes	**FSH-9a:** **FSH-9b:** **FSH-9c:** **FSH-9d:** **FSH-9e:**	MM OS-3, MM OS-4, MM BIO-6b through MM BIO-6d. Post notices to mariners. Provide financial compensation. Evaluate oil spill mitigation effectiveness after spill events; contribute funding to oil spill research. Update Shell Terminal Oil Spill Response Plan to identify Martinez Marina as an oil spill response facility and deployment site.

Table 4.4-2 (continued)
Summary of Commercial and Sport Fisheries
Impacts and Mitigation Measures

Impact	Mitigation Measures
FSH-10: Fisheries Impacts from Accidental Spills Along Outer Coast	**FSH-10:** MM OS-7; MM FSH-9b through d.
FSH-11: No Project Alternative	**FSH-11:** No mitigation required.
FSH-12: Full Throughput Alternative	**FSH-12a:** MM FSH-1 through MM FSH-10 as applicable. **FSH-12b:** MM GEO-8 for pipeline construction/ operation/oil spill mitigation.
CUM-FSH-1: Space Use Conflicts with Bay Fisheries	**CUM-FSH-1:** MM FSH-1, MM FSH-5 through MM FSH-7.
CUM-FSH-2: Impacts on Fish and Habitat from Discharge of Ballast Water	**CUM-FSH-2:** MM FSH-2.
CUM-FSH-3: Contaminant and Dredging Impacts on Fisheries	**CUM-FSH-3:** CUM-WQ-1 and MM FSH-4.
CUM-FSH-4: Accident Conditions	**CUM-FSH-4:** MM FSH-9.